PLASTICS

A Periodical Devoted to the Manufacture and Use of Composition Products

FEBRUARY, 1927

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PROBABLY this is as good a place as any and now as good a time to mention a little stumbling block we run across once in a while.

As you may have read in this column before, a business paper such as PLASTICS can only function in proportion to its revenue, of which a major part is derived from advertising. Now the little wall we find set up for us now and then is the manufacturer who says, "Why everyone in this trade knows us. We don't need to advertise; it wouldn't do us any good."

Now we won't go into the obvious and oft repeated answers to this shallow reason for not advertising, but what we wonder at is how anyone can believe that fallacy in this fast growing industry.

Where an industry has been founded for fifty years or so, and the firms in it have been going along doing business with each other from time immemorial, where the trade has been handed down from father to son, where instead of progress and new ideas there is a stale, sanctified air of sameness and retrogression, *then* there may be some slight reason for saying, "Everyone knows us; no need to advertise."

But here we have a young, lusty, growing industry with continuous new blood and new conceptions galloping in and arguing for attention. Never have we seen an industry show greater possibilities for growth and expansion than this one. And with the new and ever expanding field opened up almost daily there is surely every reason to acquaint the trade with a timely sales message.

The Publishers.

PLASTICS

A periodical devoted to the manufacture and use of plastic and composition products

Vol. 3 February, 1927 No. 2

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Vol. 3 FEBRUARY, 1927 No. 2

The Various Types of Casein

Rennet-Casein is the only kind which has thus far found wide appreciation in plastics

By Marc Fontaine

From Revue gen. des matieres plastiques, 1925 2, 236-241

A LARGE number of agents will precipitate casein, with the formation of products with different properties. These comprise salts, and magnesium sulfate particularly, lactic, acetic, hydrochloric and sulfuric acids, rennet and certain microbial organisms.

Rennet prepared casein and lactic casein are the chief varieties, the former containing 10-12% water and leaving 7% ash, the latter a little less water but only 2% ash. Theoretically speaking, acid-prepared casein is pure, as the acid removes the calcium. Using rennet, the casein is obtained as a calcium caseinate, and this absorbs calcium and magnesium phosphates. It is this calcium phospho-caseinate which has important plastic properties.

Casein precipitation when milk sours, is due to micro-organisms such as tyrothrix and the lactic ferments. The former secretes rennet, the latter lactase, a diastase capable of forming lactic acid from milk sugar. In addition, the tyrothrix organism secretes a soluble ferment, casease, able to liquefy the coagulated casein. Although lactic casein is not plastic, rennet casein is, and to a very high degree.

There appears to be some confusion in the minds of those unfamiliar with casein solids, and a belief that any kind of casein will do for plastic masses.

The present discussion of the chemical nature of this material may therefore be of interest.

Rennet-Prepared Casein.

Rennet is a soluble ferment found in the stomach of young calves raised on milk, and also in certain plants such as, artichoke, datura seeds and castor beans.

Regarding the micelle in a colloidal solution as the counterpart of the molecule of the crystalloidal solution, we find that the micelle is ionised into a large ion called a granule, and the free ions of the micelle, the latter being generally simple and comparable with ordinary ions. The micellae are never pure but are sponge-like, in that they absorb their medium. On separating the absorbed substances by dialysis we find that (1), the micellae go on increasing in size, the composition of the intermicellar medium changes, and (3), it becomes more and more easy to coagulate either spontaneously or by reagents.

There must therefore be a chemical reaction with traces of the coagulant, since the active part of the micelle itself is in minute amount by weight. Coagulation by salts is due to the substitution of their ions for the free ions of the micelle. Casein being largely colloidal, the effect of adding rennet would be to supply ions of opposite charge to those on the emulsified granules, so that a coagulum would result, and this would carry with it, by absorption, salts present with the casein. This physical conception of the coagulation process appears to be in line with the latest data, but several chemical theories have been propounded and these will now be described.

Caseinogen

In 1874, Maly was of the opinion that the precipitation was due to the decomposition of caseinogen. Hammersten followed in 1883 with the claim that rennet caused the decomposition of the casein, as a calcium salt, into paracasein and a soluble protein. Later, in 1890, this idea received support from Arthus and Pages, who later, by removing the calcium

salts, prevented the curdling process, a result also brought about by dialysis. Rennet casein was thus simply calcium paracaseinate.

Refuting this idea, Duclaux considered that milk casein exists in three different physical states in equilibrium: 1. Solid casein in suspension, 2. Colloidal casein, and 3, dissolved casein. The effect of rennet and curdling salts is to favor the formation of solid casein.

According to Lindet, rennet casein is a calcium phospho-caseinate, and the soluble milk albuminoids consist of casein rendered soluble by the alkaline phosphates and citrates of the milk. These bodies include a portion of the colloidal casein, called by Lindet casein A., and lactalbumin and globulin called casein B. Rennet or cold acid precipitates almost all the casein A, while heating above 70°C. will coagulate all the casein B. These two forms are considered as distinct chemical individuals, as their optical rotary powers and chemical properties are notably different.

Cogulated Casein

Porcher considers coagulated casein not as a calcium phospho-caseinate, but as an absorption complex of calcium caseinate and calcium phosphate. Duclaux' theory appears to be mis taken, as the milk proteins appear to be chemically different. Thus casein contains less sulphur than albumin, and, moreover, these two products yield different amino acids on hydrolysis, and when the cleavage products are the same, they are formed in different proportions.

From his investigations, Lindet concludes that one-half of the casein phosphorus exists as di- or tri-calcium phosphates, the other half combined with the protein complex, that is as calcium phospho-caseinate. Milk albumin, on the other hand contains no phosphorus.

Today, it will not be contested that the three proteins casein, albumin and globulin can be obtained from milk. This does not mean that they exist in the milk as such, for to avoid chemical changes in their isolation, one must have recourse to the new methods in use for the separation of colloids, such as filtration through semi-permeable membrane, centrifuging or even the ultramiscroscope.

A large number of factors can affect the quality of rennet-curdled casein, to name only a few, the frequency of milking, the food of the animals and the conditions of curdling.

We must confess that we still know very little about the formation and constitution of casein. Will this jeopardize the future of the casein solids industry? Positively not. Laboratory researches serve to maintain and increase the vitality of an industry, but does not technique often outstrip them?

We will cite the case of rubber, an industry which, although a century old, still circulates in a scientific fog, an industry, too, which curiously enough, presents more than one analogy with that of the casein solids. We will conclude with the hope that the latter industry may follow in the steps of its elder analogue, the world consumption of rubber reaching a figure of 475,000 metric tons in 1924 from barely 50,000 tons in 1900, surely a worthy precedent.

Centers of Production and History of the Casein Industry

By Marc Fontaine

From Revue gen. des matieres plastiques 1926, 2, 173

AFTER a study of the chemical constitution of casein and its diverse products, it will be evident that only rennet casein is convertible into an indurated product of good quality, so that only such casein will be dealt with here.

French Centers of Production.

In France the principal casein plants are not in the the departments with the highest milk production, but in the Charentes, with Normandy coming next. Sugeres is the cradle of the industry in France, for it was here that the Dairy Industry Station was founded in 1902, and in 1906, the Dairy College.

The Sugeres College was initiated by the Central Association of the Co-operative Dairies of Charentes and Poitou, with headquarters at Niort, a combine comprising in 1921, 127 dairies with a membership of 75,000.

In France the industry dates from 1904, when Kirchner founded it, and by 1912 had achieved such importance that the Co-operative Union of Casein Factories (Union Co-operative des Caseineries) was formed at Sugeres, to control both the manufacture and sale which exceeded 640 metric tons, while in 1921, sales had reached close on 1,200 tons. At Sugeres there is also the French Casein and Milk By-Products Company (Usine Francaise de Caseine et de Sous-Produits du Lait), a competitor of the Union, while other plants are at Tailleboug and Touverac, near Baignes-Sainte-Radegonde, where the co-operative plan is used.

In Normandy, the best known plants are those at Orbec (Calvados), Gournay-en-Braye (Seine-Inferieure), operated by a joint stock company, the Industrie Caseiniere and that of the Milk Products Manufacturing Company (Societe pour la Fabrication des Produits du Lait) at Chef-du-Pont (Manche). Here is also located the casein plant of the United Dairies, Limited, a London company.

There are also factories at

(*Continued on page 74*)

How Compositd Containers are Molded

Fibrous material impregnated with phenol resins forms basic material for battery boxes

IN the course of the past year, we have been in receipt of so many requests for the publication of methods for molding containers, such as battery boxes, to which demands we have usually replied individually, that we believe that the publication, in detail, of the more interesting new patents along this line, will prove acceptable to the readers of PLASTICS.

As such patents, to be properly understood, must be read in conjunction with the drawings, and do not lend themselves very well to abstracting or condensing, without losing some of the essential points, and as, in general, the methods used are usually limited to the exact procedure covered, and do not protect the idea of molding boxes, etc., basically, it is the safest policy to reproduce **ad verbatim** such portions of the patent specification as are essential for a correct understanding of the methods employed.

The Hall and Gudge Method

The following is a method controlled by the Westinghouse Electric & Mfg. Co., under patent 1,599,524; Sep. 14; on applications of C. J. Hall and B. J. Gudge.

The invention relates to a method of and an apparatus for molding composite containers, more particularly containers formed of layers of fibrous sheet material, impregnated or otherwise treated with a binder, such as the well known phenolic condensation products.

Heretofore, there have been numerous means proposed for forming containers by molding, each of which embodied some particular form of mold by which the material utilized might be given the requisite pressure and the shape desired in the finished article.

The chief difficulty in the molding of composite containers is encountered in obtaining uniform pressure of the mold on the entire surface of the article being molded, which is essential to produce the desired surface finish and the requisite physical characteristics in the molded material.

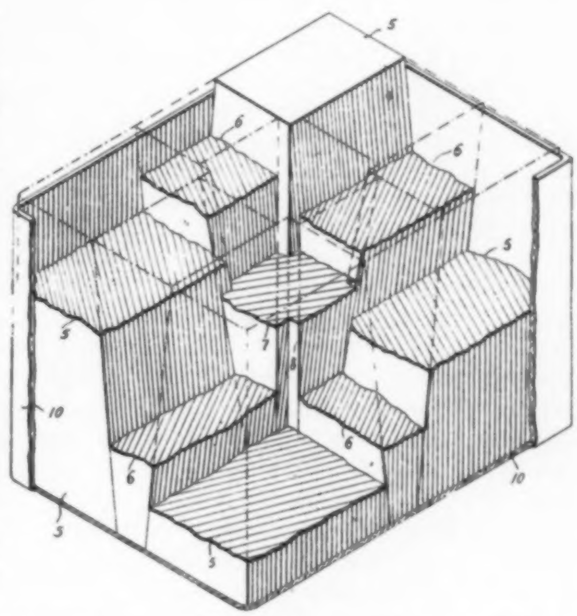


Fig. 1—A perspective view of the device embodying the principles of the patented method.

The invention is directed to a device for molding containers that provides uniform pressure on the bottom and side walls of the molded article and fully supports these members during the molding operation, which insures extreme accuracy in the contour and dimensions thereof.

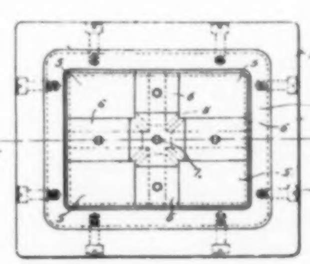


Fig. 2—Plan view of the complete mold used.

The usual matrix of the size and contour of the container to be molded, and also a plurality of pressure blocks, which are so disposed as to simultaneously compress the material within the matrix in all directions in which it has freedom of movement is utilized.

In the accompanying drawings Figure 1 is a view, in perspective, of a device embodying the principles of the invention, which is utilized in molding the containers.

Fig. 2 is a plan view showing the complete mold, utilized,

Fig. 3 is a cross-sectional view of the mold shown in Fig. 2, taken along the lines III—III of Fig. 2.

Referring to Figs. 2 and 3 the device comprises a casing 1, which is disposed around a ma-

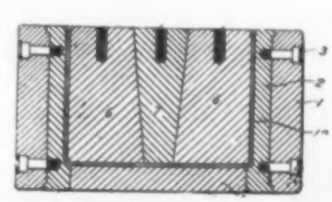


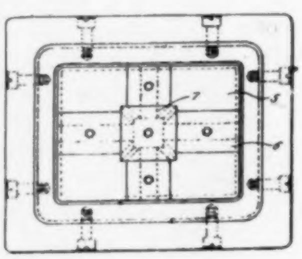
Fig. 3—Cross-sectional view of the mold along lines III-III of fig 2.

trix 2 and is secured to the same by screw bolts 3. A base plate 4 (Fig. 2) is disposed centrally of the matrix 2 at the bottom, while a number of wedge-shaped pressure blocks, comprising

four corner blocks 5, four side blocks 6 and a center block 7, are adapted to be disposed within the matrix.

The center block 7 is of inverted frusto-pyramidal shape and is provided with corner notches 8, which make it possible to shorten the side blocks 6 and prevent their interfering with each other during the operation of the mold. The notches 8 are adapted to engage the centrally extending corners of the blocks 5 to maintain alinement of the respective block members. The top portions of the blocks 6 and 7 are provided with screw holes 9 for receiving screws by means of which these blocks may be withdrawn from the mold. Such action permits the collapse of the remaining blocks, which may thereafter be readily lifted out of the matrix.

Fig. 4 is a plan view showing a modification of the mold illustrated in Fig. 2.



In Fig. 4, the corner blocks 5 are notched at their central or innermost corners to engage the corners of the inverted pyramidal center block 7 for the same purpose as the notches in the blocks 7 of Fig. 2. This construction also makes it possible to shorten the side blocks 6 and to prevent their interfering with each other during the operation of the mold.

The mold is utilized in the following manner: the material 10 to be molded is disposed within the matrix of the mold as shown in Fig. 3. The substance utilized is preferably laminated sheet material, of a fibrous nature and impregnated with a binder, such as a phenolic condensation product, which material is preformed in the shape shown in Fig. 3. The pressure blocks are assembled within the material 10 by first placing the corner blocks 5, then the side blocks 6 and lastly the center block 7, which initially projects above the other blocks.

The assembled mold is then disposed between a pair of heatable platens of a hydraulic press, heat and pressure are applied, and the center block 7 is forced downwardly, which brings pressure to bear on the side and corner blocks until the top of the center block 7 becomes level with the top faces of the other blocks and of the matrix, when the mold is in its closed position. During the application of the pressure on the center block 7 and subsequently on the other blocks 5 and 6, a substantially uniform pressure is exerted against the entire inner surface of the molded composition or material 10, which results in a container of uniform cross section and dimensions. After the material is sufficiently cured, the mold is removed from the press, and the molded article is removed from the matrix by first lifting the center block 7 (by means of a suitable screw bolt, as previously mentioned), and, subsequently, the side blocks and the cenner blocks 5, after which the article may be pushed out of the matrix by means of the base plate 4.

The mold is then ready for another charge and the operation is repeated.

Two New Uses for Pyroxylin Plastic Materials

As X-ray protectors, and as aid in electroplating non-metallic objects

TWO new uses for pyroxylin have recently been patented.

The first covers the use of sheets of this material for protecting workers with X-rays from the deleterious effects of these radiations.

The usual protective devices, or shields, used when working with X-rays, have consisted of lead plates. These are very heavy, easily bent, and not very convenient. Now the Celluloid Co. has brought out X-ray shields made from their pyroxylin plastic, which contain as fillers or pigments the oxides or other suitable compounds of metals having an atomic weight of 180 or over. Specific examples are tungstic oxide, bismuth subnitrate, bismuth oxide, metallic lead powder, lead oxide, thorium oxide and uranium oxides as UO_2 and U_3O_8.

According to the formula given in U. S. P. 1,602,688; Oct. 12, 1926, of Wm. G. Lindsay, this consists of: 100 parts by weight of pyroxylin and 185 parts of liquid tricresyl phosphate, the latter being the plasticizing agent. These materials are worked together with a suitable solvent such as methyl or ethyl alcohol to produce a plastic mass. There is then added 200 to 400 parts of bismuth subnitrate or any of the other materials already mentioned. The material is worked up into blocks, which are cut into sheets, in the well known and orthodox manner of the pyroxylin plastic art.

One use of the X-ray proof sheets is said to be their incorporation into garments as coats, jackets and caps, to be worn by workers with X-rays to protect them from the deleterious action of exposure to these highly penetrating and irritating radiations.

Electroplating

The uses to which the pyroxylin plastics, or solutions containing them, can be applied, seems

(*Continued on page 74*)

Safeguarding Pyroxylin from Fire

A continuation of the study of combustion speed and combustion products of cellulose nitrate plastics

By A. Helle-Staux

from Revue generale des matreres Plastiques, 1926, 2, 214

The present article is a continuation from p. 30 of the January issue of PLASTICS.

Importance of the Speed of Combustion in Studying Fire Prevention

The factor fixing the supply of water which should be available at the start of a fire, in order to extinguish it, is the speed of combustion, or in other words, the number of heat units evolved per minute. The majority of the failures in putting out pyroxylin plastic fires have been due to the very abnormal speed of combustion or decomposition characteristic of pyroxylin, this being from 5 to 18 times greater than that of firewood, paper and muslin. This speed increases with the temperature as is the case with all other substances.So that if, by means of sprinklers, one could keep the temperature low, even if the fire were not put out completely, the formation of combustible gases would be slowed down very appreciably. Given the coefficients of rate of combustion shown above, it should follow that, for equal quantities, from 7 to 18 times as many sprinklers would be needed with pyroxylin plastics as with fir, paper, muslin or shavings, under comparable conditions of burning.

Burning Scrap

It would seem likely that in a well ventilated room, containing a relatively large quantity of plastic and without sprinklers or other means of absorbing the heat produced, that the rate of burning would be highest. Such was the case in the fire which broke out in the scrap storage building in Massachusetts, where 16,000 kilos of pyroxylin plastics were destroyed in 7 minutes with an unheard of development of heat.

During experiments carried out in America with motion picture film in a small magazine, 850 kilos of film were destroyed in 3 minutes. As the quantity of plastic increases, the temperature goes up and the rate of combustion accelerates so that the time of combustion when no water is available, will doubtless be the same, whatever be the quantity stored in a small space. Probably solid blocks and piles of sheet will burn less rapidly than scrap or manufactured articles, the latter having more room for air pockets, seeing that pyroxylin plastics are not very good conductors of heat. For protection by means of automatic sprinklers, the number of sprinkler heads and the water supply should be proportional to the quantity of pyroxylin plastics stored per square meter.

Freak Effects

The curious thing has been noted frequently in the pyroxylin plastic industries, that inflammable liquids, wood in small thicknesss and paper, remain untouched in the heart of a fire where enormous quantities of pyroxylin plastics are destroyed in a few moments. It has happened several times that solutions of pyroxylin in amyl acetate or other inflammable liquids did not catch on fire in rooms where large quantities of scrap were consumed few yards away. These curious observations can be explained by the fact that the hot gases from the decomposition of the pyroxylin have so great an affinity for oxygen, that they absorb it completely, leaving none for substances which burn more slowly.

Risk Arising in Pyroxylin Plastic Fires from the Speed of Gas Formation

The volume of gases from the decomposition varies with the temperature. It is to the speed of their formation that the destructive effects, sometimes noticed during fires, are due. In a low temperature decomposition (German experiments), 450 kilos of pyroxylin plastics should yield nearly 85 cubic meters of gases. Dr. Will's experiments have shown that, at high temperatures and pressure, the decomposition of 450 kilos of plastics liberates 250 cubic meters of gases reduced to normal temperature and pressure. So that, from an equal quantity of pyroxylin plastics there is obtained three times as much gas at high than at low temperatures.

The volume or pressure of the liberated gas, as well as the speed of its formation, increase directly with the temperature. So that, when a large quantity of pyroxylin plastic decomposes in a small room without sufficient ventilation, the expansion of the gases can bring down any ordinary building of brick or cement.

The Lubin Film Fire

This has been demonstrated in several fires in magazines, and among the most remarkable cases, during the destruction of the Lubin Film Company's magazines at Philadelphia. Four cement roof-

Philadelphia. Four cement roofed maganizes of brick, 30 centimeters thick, were destroyed in a few minutes by the expanding gases from the burning film. Another similar case was that of an artificial leather factory in Massachusetts, when a magazine was destroyed in 7 minutes by the pressure of the gases from 16,000 kilos of pyroxylin scrap.

In both cases the magazines were provided with ventilators but these were not big enough to allow the gas to escape as quickly as it was formed.

Explosive Gases From the Decomposition of Pyroxylin Plastics.

In many pyroxylin fires there have been very violent explosions, bringing down walls and destroying buildings. These have resulted from the union of the decomposition gases with air. Among others is the case of the Ferguson Building in Pittsburg, where the gases from some motion picture film, decomposing in a magazine, escaped through cracks in the door and caused an explosion in the next room, seriously damaging the building.

From experiments with the decomposition gases from pyroxylin plastics, it has been established that after passing through water, the gases lose their explosiveness and even become only mildly inflammable. German experiments seem to indicate that if this is so, it is because camphor is the chief factor in explosion.

Undoubtedly, other explosive gases arise when there is no water with which to absorb the heat, and in consequence, the temperature can rise high enough to produce combustion.

Poisonous Gases.

Two toxic gases are present in large amounts in decomposing pyroxylin products. The one most often mentioned is carbon monoxide, although its characteristic toxic effects have not been noticed in pyroxylin plastic fires. Present in the air in large quantities, its effects are very soon evident, the victim losing consciousness in a matter of seconds. With the requisite appliances used soon enough, the victim can be brought round.

Nitrous vapors, which in accordance with tests carried out in Germany, also arise from the decomposing plastic, are most of the poison usually found in the course of probes into several pyroxylin fires. It makes itself felt more slowly than carbon monoxide, but breathed in large quantities, the result is a much more serious matter. In fatal cases, death ensues only after many days and sometimes only after the lapse of many months. These vapors are soluble in water, so that in case of fire, the water from automatic sprinklers will largely reduce their radius of action.

Danger to Adjoining Buildings.

Fires involving large quantities of pyroxylin plastics have often reached buildings made of inflammable materials, 50 and even 60 yards from the hub of the conflagration. This can occur in three different ways.

(1) By the rapid formation of vast quantities of unburnt inflammable gas, giving rise to sheets of flames when the air supply is sufficient for complete oxidation. A terrific amount of heat is let loose, which sets fire, by radiation, to everything nearby that can burn.

(2) As pointed out in many reports on these fires, the wind may blow large volumes of burning gas in the direction of non-fireproof buildings or those with combustibles inside. In a case in point, the burning gas found its way into a building through cracks in an iron firedoor, and set fire to the pyroxylin plastics inside. So that it becomes a very difficult proposition effectively to safeguard buildings near such a fire.

(3) In a certain number of instances, the stream of heated gases may carry with it small particles of burning plastic. In an American experiment in which 900 kilos of film was set on fire in a small magazine, a flame from the ventilating flue, 24 yards long, carried with it numerous pieces of burning film, varying in length from 2 feet to 2 yards, several being found nearly 50 yards away.

(To be Continued)

Feb. 2.—As PLASTICS *goes to press, word comes of a disastrous conflagration which swept the film reclaiming plant of the Cello Film Co., Fort Lee, N. J. Within an hour, several buildings were destroyed with damage to the extent of $250,000.*

Practice Golf Balls Break up into Powder when Struck

Although the inventor, Richard Harig Travers, says that his practice golf balls are preferably made of clay or such material, it should not prove difficult to make the same from other plastic and induratable material.

The claims of the patent (U. S. P. 1,602,725; Oct. 2, 1926) are for an "indoor practice ball being hollow and having thin fragile walls composed of a material which will pulverize when the ball is struck by the club" etc., so that they would cover any such ball no matter what the material used. The purpose is to provide a ball that can be used but once, and will then fly into dust. This will also provide the user with an indication of how squarely the ball is struck.

It should be possible to make this of other material than clay.

If the ball is struck correctly, nothing but a cloud of dust will be formed, but if the ball is "topped" or only partially hit, some of it will remain unbroken.

Decorating the Surfaces of Ebonite and other Hardened Plastic Materials

Use of "Laccanite" or "Urushiol" on hard rubber, sulfuric acid on casein, and solvents on pyroxylin described.

The surface decoration of plastic materials, other than the effects produced by the molding or drawing operations, is a distinct art.

Much of this involves hand work and considerable skill. Besides the use of "transfers," the etching and inlaying processes are used.

The present article is based on a German publication, and a recent U. S. patent by a Japanese.

A RECENT article in the German publication *Butonia* (1926, *35*, 303) gives a number of methods for producing etched and mottled effects upon the surfaces of casein plastics and pyroxylin goods. The author of the article, whose name does not appear describes the following methods which are stated to give satisfactory results.

"In order to etch materials made from Galalith or similar casein solids, it is important that the material should be perfectly clean, and ground flat or polished. The parts of the article that are not to be etched are coated with a reserve consisting of molten beeswax or earthwax (such as paraffin, ozokerite or the like). The etching fluid should consist of pure sulfuric acid, which must be preserved in glass containers. The etching is best done in glass or porcelain acid-proof vessels.

The Acid Resist

The wax is applied with a brush, and when cold the necessary design is engraved in it so that a part of the actual surface of the article will be exposed. The goods are preferably placed in a stone-ware sieve, covered with a perforated stone plate, and the whole thing immersed in the etching acid.

To obtain an etched effect, say 3 millimeters deep, about three hours immersion are required. After the etching has progressed to the desired point, the goods are removed from the acid and placed in water, where it is best to support the objects on small wooden pins so that the water can flow freely around them. The washing should be quite thorough and it is a good plan to add a little ammonium hydroxide to the final or semi-final wash water to insure complete neutralization of the acid that has penetrated the articles.

The wax is then removed and the goods dried, after which they can be polished as usual. Drying racks consisting of wire-mesh are very suitable for the purpose.

For Pyroxylin Products

Pyroxylin plastics can also be etched, only in this case the etching fluid does not consist of acid, but of some pyroxylin solvent, such as acetone, amyl acetate or glacial acetic acid. For etching not too deep, ordinary glacial acetic acid is best. The reserve wax should be insoluble in the solvents. Earth wax, (ozokerite) is suitable. A very pretty effect can be obtained on pyroxylin plastic articles by coating them thinly with this wax and then scratching wavy lines through the coating by means of a fine steel comb, and immersing them in a mixture of glacial acetic acid and acetone in about equal parts.

This operation should be done in a warm, dry room, as otherwise there is danger that white spots (blush) will appear on the materials. Beautiful marbled effects can be obtained by placing drops of a mixture of alcohol and pyroxylin varnish (for instance Duco) upon the surface of the articles, and then blowing upon the drops to spread them around without any particular effort to produce a design. Parkert makes the excellent suggestions to take a rubber sponge or small bath sponge, to moisten the same with a pyroxylin solvent and then to sponge the goods with this. If colored by pyroxylin varnishes are used instead of clear solvents, some very striking colored effects can be obtained on light-colored pyroxylin goods. Addition of bronze powders and other pigments allows still further modification, and there is almost no limit to the novel appearance that can thus be imparted to the materials.

Inlaid Effects

A further modification in decorating plastic articles consists in first etching them and drying, after which the etched design is filled with Syrian asphalt, which will produce an inlaid effect, either black or brown, depending upon the dilution of the asphalt. For fancy combs and similar objects, this is highly recommended.

A little experimenting on the part of those attempting to follow these suggestions, will undoubtedly enable still more interesting decorative effects to be obtained.

The phenol resin products due to their insolubility in most sol-

vents, do not lend themselves so readily to etching methods, but must be treated by surface-coating.

Recently perfected photograhpic means for producing beautiful designs on panels, etc., will be the subject of a special article to appear in PLASTICS soon.

On Ebonite

Hard rubber, or ebonite, properly belongs among the thermoplastic materials. Due to the rather limited range of colors obtainable, it has been found rather difficult to decorate this material. Ryosuke Namiki, of Japan, has patented a method of working upon the surfaces of ebonite articles, which consists essentially of changing the surface of the hard-rubber article into a new substance which he calls "laccanite or Lacconite" (both spellings are given).

According to the invention the skin portions of ebonite are converted into another substance different from ebonite proper both in nature and composition, which substance is known as "laccanite". The laccanite is substantial, strong and hard in nature, and extremely durable against efflorescence.

Many attempts have already been made to cover ebonite surfaces with another material, but partly due to the covering material selected and partly due to improper method of applying the same, such as by mere painting, none of them has shown any successful result.

According to the invention, there is used a varnish which was formerly peculiar to Japan and known as "japan lacquer."

The varnish or japan lacquer is made from the juice of a tree known in Japan as the "urushi tree". Its composition is not quite definite but varies according to the soil and climate, as well as method of cultivation and other conditions.

Analytical examination of three typical examples give the following conclusion:

Urushiol or japanic acid is an inorganic acid proper to japan lacquer and contains tannic acid.

An ebonite article to be worked on is, whilst in a cold condition, rotated about its axis or reciprocated in a plane, at a considerable high speed. These movements may be effected by any suitable means. To the moving surface of the ebonite article there is applied a piece of felt having the varnish or japan lacquer adhered thereto, and which felt is applied to the article with a certain amount of pressure. As the movement proceeds the varnish is gradually forced into the surface portion of ebonite, or in other words, the surface portion is impregnated with the varnish. The impregnation is facilitated by the heat generated by friction of the felt.

By the above process, the surface portion of the ebonite is converted into a substance which is substantial, strong and hard in nature and non-hygroscopic and durable against the air.

"Laccanite"

It is assumed that during such treatment, free sulphur contained in the rubber and an acid proper to the varnish, forms a kind of sulphide called "laccanite" which has the nature above disclosed.

For articles, on the surfaces of which patterns or figures are to be produced, the above process can not be directly applied. In this case, the ebonite article to be worked on is first prepared through the usual process or patterning, that is to say its surface is marked with a pattern or figure which is a negative of the desired pattern, by means of a pressing mould before it has been cooled. The article is then cooled and subjected to the laccanite process as previously disclosed.

By this treatment the article, having a negagtive pattern or figure on its surface, is covered by a continuous or plane layer of laccanite as the surface portion is uniformly subjected to the laccanite process, irrespective of the concave and convex portions of the negative pattern. In other words, the concave parts of the pattern are filled up by laccanite and the convex parts are covered by a thinner layer of laccanite than for the former. The article is then dried up and finished. After the finishing the article is subjected to heating at a temperature of about 70°C to 80°C for example by means of hot water or air. Upon heating the impressed pattern or figure, or in other words the concave portion of the surface of ebonite proper reappears by reason of the mechanical stress initiated by the pressing and consequently the finished plane surface or the layer of laccanite projects at the parts corresponding to the said concave portions, thus producing upon the surface the desired pattern or figure.

The resulting pattern or figure is formed by the laccanite only which covers the ebonite proper, and consequently is strong and hard, durable against any humidity and heating, and has not the tendency to gradually disappear, as in ordinary ebonite, except by wear.

Mr. Namiki's process is covered by U. S. P. 1,600,293, Sept. 21, 1926.

Metal and Guncotton Foil.

Matushita Kosai, of New York, claims to produce a soft and pliable metallic sheet by compositing metallic foil with a film of glycerol, gelatin and gums on the one hand, with a pyroxylin film on the other, and adding a third layer of rubber composition.

The material is intended to be used for attaching to other articles, somewhat in the manner of other decorative foil, or leaf-metal.

The softness and pliability of the product allow of attaching it to flexible supports, and even

(Continued on page 80)

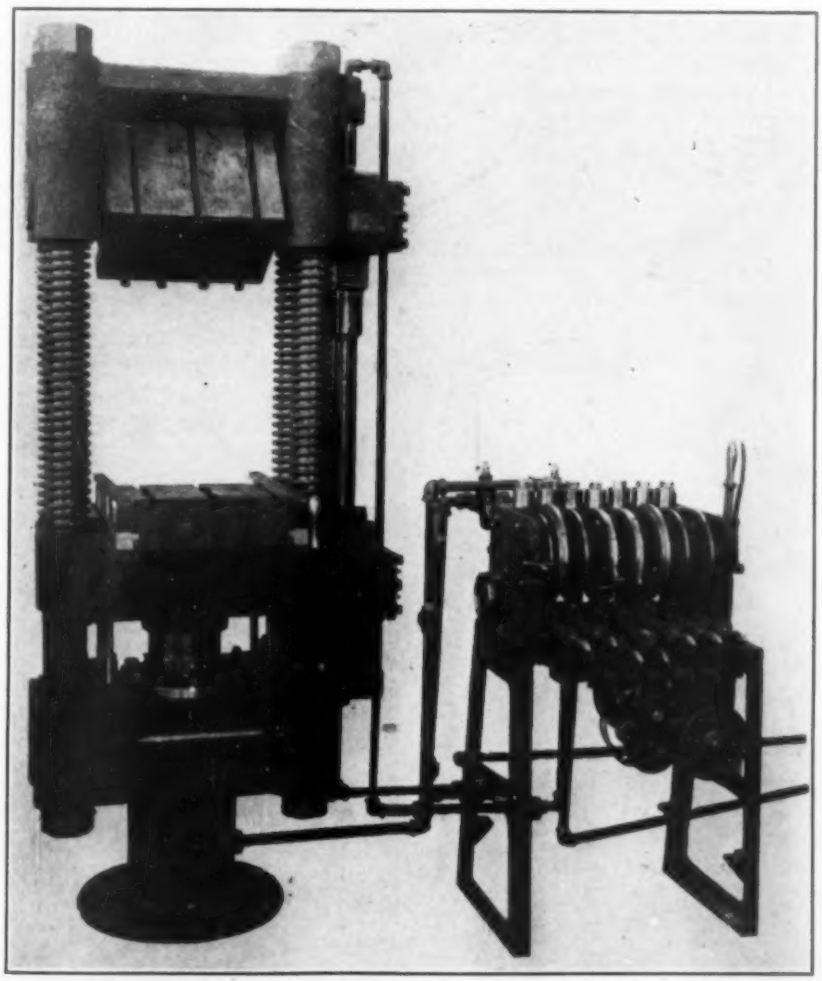
Automatic Control of Operating Valves on Hydraulic Presses Speeds Up Production

Elimination of human judgement as to the timing of each stage of the molding process insures uniformity

It is the object of the editor of PLASTICS *to discuss in detail the more modern forms of hydraulic equipment available to molders, as this rapidly expanding business must needs have many who are comparatively new to the art and hence not completely conversant with all the ramifications of this complex industry.*

A NEW automatic hydraulic molding press, illustrated herewith has been especially developed for molding of phenolic condensation products, pyroxylin compounds, etc., and to materially reduce their costs of producing duplicate parts in considerable quantities. Among the important contributing factors are:

1—Very material reduction of attention required on the part of the operator.
2—Reduction in the idle time between molding operations.
3—Elimination of defective molded parts.
4—Simplified press equipment at reasonable price.
5—Rigid press construction with low maintenance charges.



The automatic press shown above is actuated by the control-valve located on the device at the right, the valves being operated by cams.

Full Automatic Control

Every part of the operating cycle from beginning to end is completely controlled by a multiple unit motor driven valve. This is built as a separate unit and located to the right of the press. Each of the seven valve. This is built as a separate unit and located to the right of the press. Each of the seven valve stems is actuated in proper sequence by a suitable cam. The cam shaft is driven, through an adjustable speed change mechanism, by a small electric motor of usual design.

This automatic valve can be adapted to almost any molding cycle both as to duration of each part of the operation and sequence of operations. However, in the usual Bakelite molding cycle the operations automatically controlled are as follows: Steam is applied to the chambers of both upper and lower dies. The dies are moved to pressing position as explained in detail later. High hydraulic pressure is applied to the main press cylinder after the phenol resin has become plastic and has had an opportunity to flow into every cavity of the die, after which the steam supply to the die chambers is cut off.

Cold water is now circulated through the die chambers for chilling and setting the molded pieces, whereupon the high pressure is cut off from the main cylinder, which is then connected with the return line. The main ram is withdrawn

through the action of the auxiliary rams, thus separating the two halves of the die.

In addition to controlling the regular molding cycle, this valve also controls several special movements of the press which are as follows: The head carrying the upper part of the die, is revolved through an angle of about 120°. The table, carrying the lower half of the die, is moved to the forward end of the table supports. Both of these movements take place practically simultaneously, and as the ram is making its return stroke. Also, an ejecting mechanism is automatically operated at the same time in both the revolving head and the sliding table. Hence, ejecting pins can be used in both halves of the die, or either one, as may be required.

At this point the cam shaft on the automatic valve reaches the end of its revolution. Here a simple and positive electric cut-out mechanism is actuated by a cam, thus stopping the motor.

A Second Cycle

The operator can now remove the finished pieces, clean the dies, place new inserts, and reload with raw compound. After that all he has to do is to throw a small lever which starts the motor and a new revolution of the valve cam shaft begins. Both the head and table take a positive position in which they are rigidly held during the entire pressing operation so that alignment of both halves of the die is assured.

Labor costs are reduced when this type of press is used because of complete automatic control. Hence, no attention is required of an operator during the actual molding cycle and furthermore, younger and less experienced operators can be employed. The operator can take care of other duties near the press during the molding operation or one operator can attend several presses.

The idle time betwen operations is reduced to a very minimum, due to the movement of the two halves of the die out of the pressing position, to one of convenience and safety. This is an especially vital feature when complicated dies are used, when inserts must be put in place by hand. The safety and comfort for the operator in working on the dies in this position is another feature of great importance. Every improvement in working conditions pays big dividends in increased efficiency besides making the shop a desirable place to work.

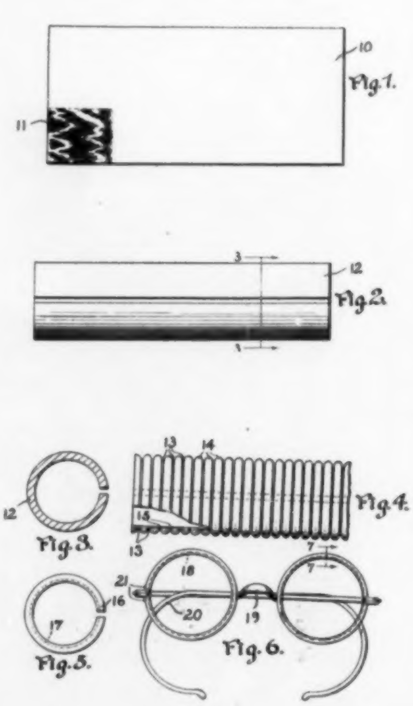
The production of improperly molded parts, which will not pass inspection, is eliminated when this press is used. This is due to the fact that the entire molding cycle is timed perfectly through the automatic control, with the human element entirely eliminated. Hence, once the press is set and properly timed by the foreman for the particular piece to be produced, the operator merely serves the press and does not control it.

This new molding press is rightfully designated as a Universal Machine because of the great variation possible in the automatic timing of the molding cycle. The total time for the completion of an operating cycle can be increased to as much as 500% of the minimum in a range of nine equal steps. This can be done very readily and quickly through a simple adjustment of the speed change

(Continued on page 84)

"Demi-Amber" Zyl Eyeglass Rims Cut from Tube of Mottled Sheet

A RATHER novel and economical method for making the socalled "Demi-amber" Zyl lens rims for eyeglasses has recently been patented by Elmer L. Schumacher, assignor to the American Optical Co. (U. S. P. 1,599,844, Sep. 14, 1926).



The inventor describes his process in the following terse terms, which, although somewhat technical, clearly set forth the method employed.

As shown by the accompanying illustrations, in which Fig. 1 is a top plan view of a sheet of the raw material used in my process, a section of the same being mottled, to more clearly illustrate its particular nature; Fig. 2 is a top plan view of a split tube formed from the sheet illustrated in Figure 1,

Figure 3 is a transverse sectional view, taken on line 3—3 of Figure 2,

Figure 4 is a side elevation partly broken away, of a group of semi-finished rims formed on a tube of the material,

Figure 5 is a side elevation of a completed rim,

Figure 6 is a front elevation of an ophthalmic frame to which a pair of these rims have been applied, and

Figure 7 is a transverse sectional view, taken on line 7—7 of Figure 6, show plainly the

(Continued on page 85)

Production of Mottled Molded Objects

Made easy by use of a number of preformed biscuits differing in color and shape

The desire to produce striated and burled effects when making molded products, in imitation, somewhat, of the mottled pyroxylin plastics, has led to various attempts to mix differently colored plastic material together. However, when done with molding powders, the effect has usually been rather unattractive, as the flow-markings did not look "natural". By preforming charges of differently colored molding powders, this can be done, as described in the interesting recent patent, the gist of which is given in the present article.

THE production of varicolored molded plastics from molding powders is interestingly described by Harry N. Copeland, of Dayton, Ohio, in a patent granted him July 20, 1926 (U. S. P. 1,593,525), and assigned to the Kurz-Kasch Company of the same city. The patent proceeds to say that:

The invention relates to the molding of phenolic condensation products and the like, and more particularly to the production in the molded product of irregular grain-like surface markings, somewhat in imitation of the irregular striate and rayonnant markings found in burly walnut, mahogany, and other fine ornamental wood.

Using Preforms

In the present instance, it has been discovered that by preforming the material into a tablet of such shape that it will not initially fill the mold space, but will leave recesses therein, into which the material is displaced under pressure as it becomes soft, and by regulating the temperature, so that the material is displaced under pressure into such open spaces, while in a viscous or plastic condition, without becoming thoroughly liquified, it is found that the combination of colored materials will form striæ, sometimes radiating from a central foci, and sometimes scattered and confused, giving to the distribution of the different colors a curdled appearance or burled effect, which is more or less controlled within reasonable limits by the shape and arrangement of the material within the mold.

The object of the invention is to provide a simple, efficient and effective method of producing an ornamental irregular grain design, upon phenolic condensation in the imitation of


Fig. 1.


Fig. 2.


Fig. 9.


Fig. 10.


Fig. 11.


Fig. 12.

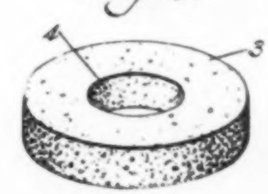


Fig. 3.

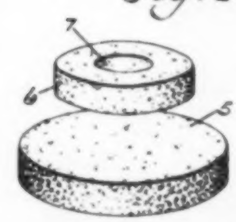


Fig. 4.


Fig. 13.


Fig. 14.

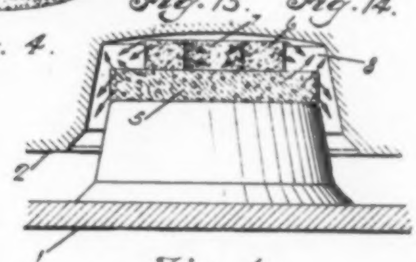


Fig. 6.

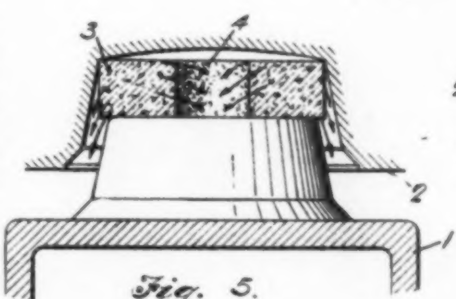


Fig. 5.

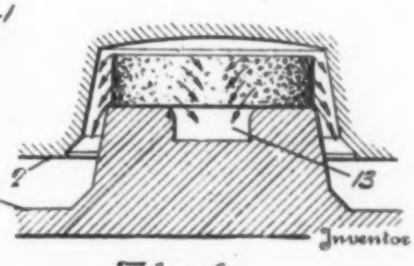


Fig 8

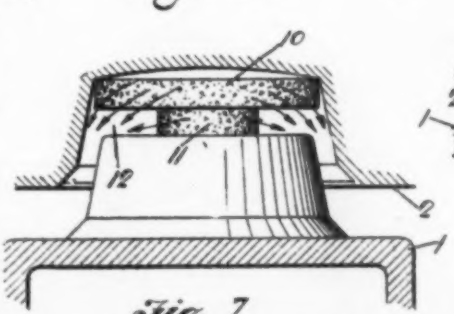


Fig. 7

burly effects of fine cabinet wood.

In the accompanying drawings, the preferred steps for carrying out the process are shown, and illustrations of the product, Figs. 1 and 2 are top plan views on radio instrument knobs, or the like, which have been adopted for illustrative purposes, the surface delineation showing two of the endless possible effects which may be attained by the present process. Fig. 3 is a perspective view of the tablet or preformed charge of phenolic condensation material, from which is produced, substantially the effect shown in Fig. 1. Fig. 4 is a perspective view of two shapes of preformed tablets or slugs of material, which when employed together produce certain variations or modifications of the rayonnant design shown in Fig. 1. Figs. 5, 6, and 7 are sectional views of molds for forming such articles as radio instrument knobs, illustrating different forms of charge or tablet, and different distribution of the material, within the mold to produce different ornamental design effects in the surface markings of the product. Fig. 8 illustrates a modification, wherein the surface marking is varied by a modification of the die in lieu of variations of the charge or tablet. Figs. 9 to 14 are detail views, suggestive of various shapes of tablets or preformed charges of material to produce different grain or color designs or effects.

Steering Wheels and Picture Frames

The invention is suitable for the manufacturing of a number of articles such as automobile steering wheels, electrical switch housings, buttons, frames for pictures, or in fact any article which may be molded from phenolic condensation products.

Referring to the drawings, 1 indicates the male die and 2, the corresponding female die or matrix for the production of a radio instrument knob. These dies 1 and 2 are steam heated or heated by other means to afford the necessary fusing and curing temperatures for the material. In the present process, the material of granular form and intermixed colors, is preferably preformed into a tablet, which contains the proper charge of material, by being cold pressed, so that such tablet will maintain its shape. It has been found that by preforming the tablet or charge into annular form, as shown at 3, and subjecting such annular tablet charge within the mold to a comparatively low fusing temperature of approximately two hundred to two hundred and forty degrees a rayonnant design, in which the striæ of different colored material extend outwardly from a central foci, as in Fig. 1 is produced. The effect of the design is controlled somewhat by variations in temperature. If the temperature is normally high, to fuse the tablet to a flowing condition, the color material will be more or less evenly intermixed, and the striate design will not be present in any marked degree. However, by fusing the material at a low temperature, whereby it becomes plastic only or in a condition to flow but slowly, the increase of pressure causes it to be displaced inwardly into the central opening 4 of the annular tablet 3, and at the same time, the outer portion of such tablet is displaced outwardly and downwardly. Being in a plastic or thick viscous condition during its displacement, the color material is pulled inwardly to fill the central opening 4, and at the same time pulled outwardly to form the side and margin of the product, thereby producing radial flow lines of the different colored material, which flow lines remain visible in the finished product, affording a highly ornamental and pleasing surface, somewhat in imitation of wood graining. Various other effects can be produced by varying the shape of the tablet or charge. It has been found by experiment that by employing a solid tablet as at 5, and superposing thereon a smaller annular tablet 6, of less diameter, a different effect is produced, wherein the rayonnant design is not so decided nor extended as in Fig. 1, but in which the outer margin of the radially disposed striæ are confused and distorted to afford a somewhat intricate or tangled burled appearance, surrounding the central radii. This arrangement of the charge within the mold is illustrated in Fig. 6. The placing of the smaller annular tablet 6 upon the solid tablet 5, affords a central recess or space 7, into which the material is slowly displaced while in plastic or semi-fluid condition, and also at the exterior of the smaller annular table 6, and it affords an annular space 8 into which the material is displaced upwardly from the margin of the solid tablet 5 and also outwardly from the superposed smaller annular tablet 6. It is this intermixing of the material flowing in different directions, into the space 8, which affords the burled or confused striæ effect, while the inward flow or pull of the color material as it is displaced into the central opening 7, produces the central rayonnant design of lesser extent. A still further ornamental burled effect somewhat similar to that illustrated in Fig. 2 may be produced by superposing a larger

(*Continued on page 76*)

The future furniture manufacturer, as well as the maker of interior lighting fixtures, will find in molded phenol resin products, a new field for the development of startling ideas.

The great durablity and beauty of finish obtainable by molding greatly exceeds that of either wood or metal. Varnish will crack and metal will tarnish, but the phenol resins do neither.

EDITORIAL · IMPRESSIONS

We Believe In Dreams!

ONE of the most pleasant tasks of an editor is to indulge, occasionally, in day-dreaming. But, idle as such dreams might sometimes seem, there is nevertheless the fascination attending any half-conscious attempt at a forecast of the dim and distant future.

Plastics—Here is a field, that, despite the great industries that have sprung up in the past half-century, is really and truly still almost in the condition of the "wild and wooly West" of the early sixties of the nineteenth century. Here and there an outpost, but the remaining "wide open spaces" still remain to be filled, and to become, in time, bee-hives of industrial endeavor.

Dimly seen, as through a mist, but perhaps not quite as far away as many of us believe, there are these possibilities:

100% utilization of our lumber resources due to the development of synthetic molded products which make use of every last scrap of the felled tree: the sawdust for woodflour; the bark for filler for plastics; the resins to be hardened for binders; the smaller twigs and branches to be carbonized for activated charcoal; and even the leaves and roots for the preparation of solvents by ways which still remain to be devised.

Molded window frames with panes of ultraviolet-light-permeable synthetic windows; molded furniture of every conceivable type (a splendid chance for laminated products); all lighting fixtures and interior hardware made from molded synthetic materials; the banishment of rust by the use of permanently impermeable coatings that will cling to iron throughout its life; completely synthetic floor and wall coverings that ask nothing more from nature than a supply of carbon from natural rock carbonates and hydrogen from the electrolysis of water.

As to that, the synthesis of organic compounds from carbon dioxide and hydrogen has already been accomplished successfully; so that the chemist is no longer dependent upon organic raw materials for raw material for organic "synthetic" products.

The motor car of the future (and in fact some of them of today) will have molded bodies made of one piece. Airplane pontoons have already been made from phenol resins; and the airplane of tomorrow, when there will be thousands where there is now but one, will have many of its parts made of materials the nature of which we have not as yet even dreamed, much less attempted to create!

In our homes, in the future, we shall have non-breakable molded dishes, at half the weight and twice the beauty of any ceramic product of today or the past. Molded dishes at a price so low that dish-washing will become a lost art. Synthetic rubber or similar elastic material so cheap that all of the future railways, if there remain any, will run on balloon tires, and noise will be a thing of the past.

Truly, if man at any time in his career, has had the actual shaping of his future in his own hands, now is that time. Indeed a Plastic Age!

And then we woke up.

But, its a nice dream; a pleasant dream; and, who knows, a profitable dream. For it is from such dreams, in the minds of the pioneers and inventors of today and tomorrow, that our New Prosperity is to come.

But to make it come true requires one thing more: hard work and, most of all, courage. Courage to dare to do the unusual; the difficult, the **impossible.**

And so, comrades and collaborators in the field of **Plastics**, gird yourself for the contest of tomorrow; and be prepared to reap the rich harvest that awaits those who are now wisely planting for the future.

PLASTICS

A New Industry

THE blood-shed of the piping times of peace (and we most emphatically are not referring to the crime wave), is enormous.

The blood from the animals daily slaughtered in the United States alone would fill a fair sized pond.

While much of it is utilized, a good deal as fertilizer, another goodly portion is simply wasted. Only recently, and, we must say, in countries other than ours, dried blood is being used for molded products.

There is still much prejudice against this material; mostly on esthetic and sanitary grounds. Both objections are unfounded. Milk, from which casein is made, is just as much an animal fluid as the blood; and who has ever objected to the rich juice of a luscious rare steak?

Properly hardened, and when made right, blood plastics have a distinct place, and, it is confidently believed, will be as much thought of as competitive products. Here is a fine chance for an American industry.

Domestic Development

THE casein solids industry has been dependent almost entirely upon **imported** rennet-precipitated casein for the manufacture of its produce. The steadily increasing

prices, coupled with the incidental difficulties due to procuring a supply far from home, have been somewhat of a handicap in developing this industry to a point where it could truly be said to be thoroughly prosperous. This is not at all to be understood as implying any lack of success on the part of the casein solids, for surely no modern plastic material has had a more remarkable rise to popularity, especially for ornamental uses.

Up to the present, color effects have been possible with the casein plastics that have been the despair of the molders of the phenol resins; and although we have been aware of colored molding powders, nothing even approaching the mottled and striated effects possible with casein solids (and, of course the older pyroxylin plastics) has been produced.

What Is Needed

With the new industry apparently firmly intrenched, it would appear advisable to found a strictly domestic casein industry. What is needed most is a supply of American rennet-precipitated casein. As most of our readers are aware, acid-precipitated, and "sour" caseins, while perfectly suitable for the preparation of water-paints, adhesives, sizing for paper etc., are not adapted for the painstaking requirements of casein-solids production.

There has recently been a rumor to the effect that certain interests were on the point of establishing a "farm" devoted entirely to the production of a low-cream milk for the specific production of rennet-casein. The main reason for this is that skim-milk and butter milk, due to their high acidity, and difficulty in transportation to casein plants before they get sour, make it necessary to produce the best casein-solids raw material from milk which has not soured naturally.

Due to the large amount of water in the milk, the rennet-casein plant must needs be in close proximity to the milk-supply—in other words, near the cow.

France has already done much to develop the rennet-casein industry, and so has South America. Can American producers do the same thing?

With the proper support of the casein-solids manufacturers themselves, we believe they can—and should.

Style In Pens

THE revolution in fountain-pen barrels has triumphed. The hard rubber barrel is in the discard, and the gaily colored pyroxylin, casein and molded products are firmly in the saddle.

There is a good lesson here. Never be too sure that your product simply "can't be replaced." Eternal vigilance is the price of success as well as of liberty, as the old saying had it.

Outlook of the Celluloid Company

Facts in Letter Addressed to Stockholders

JUDGING from a letter addressed to the stockholders by Walter C. Heath, chairman of the board, one result of the reorganization of the Company under the presidential regime of Mr. Campbell, has been the earning of a small operating profit for the first nine months of 1926 as compared with a serious loss for the corresponding period of the previous year.

After a careful revaluation of the Company's assets, a possible decrease of about $1,000,000 in the book value of the common stock may have to be provided for by the formation of a reserve fund. It is gratifying to learn, however, that the liquid financial condition of the organization is such that no additional financing will be necessary for this purpose.

Economies in operation, equivalent to an annual saving of $350,000, have been instituted and the Company's indebtedness at banks substantially reduced. As compared with the first nine months of 1925, shipments to December 1, 1926, show an increase of 10 per cent. Complete harmony prevails both internally and with the committee representing the preferred stockholders, and the letter concludes with the belief that the close of 1927 will mark the favorable outcome of past, present and future efforts at reconstruction.

Siemon Company Expands

Acquires Control of Watertown Co.

THE Siemon Manufacturing Company, of Bridgeport, Conn., has acquired controlling interest in the Watertown Manufacturing Co., Watertown, Conn., makers of bakelite and other molded composition products as well as telephone and radio equipment.

Following this purchase, the Siemon interests become the largest manufacturers of molded insulation in this country.

Carl F. Siemon and Waldo C. Bryant originated the concern in 1903 as the Siemon Hard Rubber Company, an organization which has since taken over the Specialty Insulation Manufacturing Company, and the Colasta Company, both of Hoosick Falls, N. Y., and the Duranoid Company, of Newark, N. J.

No change will be made in the managemnt of the Watertown concern, of which Charles S. Buckingham is president and treasurer, and Thomas F. Butterworth is secretary.

FARREL

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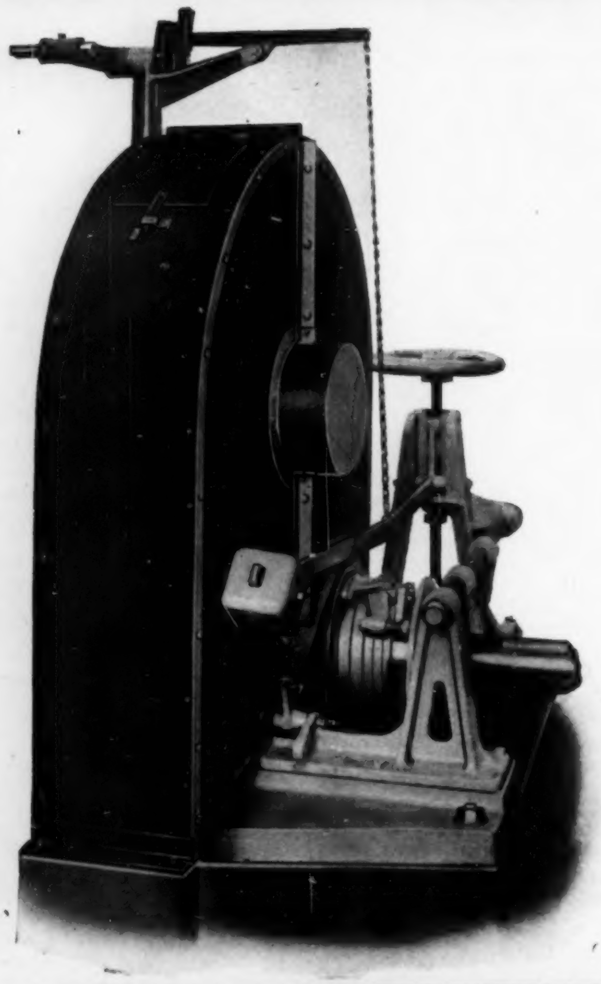

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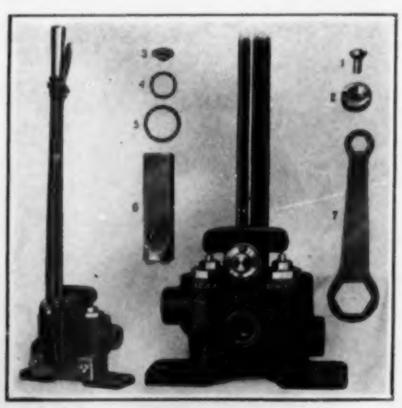

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RALIN

RODS TUBES

330 Fifth Avenue, New York City

Casein Industry

(*Continued fom page 54*)

Landrecies and Sains-du-Nord (Nord), Clefs (Maine-et-Loire) Dange (Vienne) and Antrain-sous-Couesnon (Ille-et-Vilaine), that at Dange belonging to the Societe Lactaire, that at Antrain to the Usines de l'Angle.

It is estimated that for profitable casein manufacture, a minimum amount of from 100 to 130 hectolitres of milk must be treated daily, otherwise cheesemaking is the preferrable proposition. On the other hand, when the location is favorable as in the Charentes and Normandy, the manufacture of butter and casein may be regarded as naturally complementary.

In South America

In the Argentine, where the dairy industry has developed very rapidly during the last 20 years, the manufacture of casein is extending. The industry was started by two Americans about 20 years ago and immediately had to meet American competition from two companies already in the field—the Casein Company of America and the Union Casein Company founded about 1900. We believe, however, that their product has been chiefly casein precipitated by acid, rather than product consists of rennet casein, which is sold to German manufacturers of plastics, and of casein prepared with acid, disposed of to American makers of coated paper.

Among the best known Argentine firms are those at Tandil in Buenos-Aires province, the Landilera Company, Esmenotte and Sons and the International Casein Company. Argentine manufacturers are not well enough equipped for the manufacture of rennet casein, a process requiring more care than the other. Topographical considerations also play their part, as fresh milk with low lactic acidity is essential, a condition which cannot always be realized. Yet the Argentine production of rennet casein ranks after that of France, with America next.

Danish Casein

Similarly with Denmark, an important market could be obtained for rennet casein, but so far the Danish product would appear to have been chiefly lactic casein. Both varieties must, however, be made, export going through either Copenhagen or Aarhus for New York, Boston or Hamburg. These remarks also apply to the quality of the Swedish product.

In the winter of 1909-1910, owing to the low prices commanded by native cheese, Danish dairies were suffering heavy losses. At the same time the situation in the Argentine market had raised the price of casein sharply, so that the manufacture of casein seemed a happy solution of the crisis. Since then casein has played the part of price regulator in the Danish cheese market, the two industries having become complementary. Danish casein, although inferior to the French product, appears to be of excellent quality.

In New Zealand, where particular attention has been paid to the casein industry for some years, the New Zealand Co-operative Company has been formed at Hamilton, an organization comparable with the French co-operative society already mentioned. This company has also been led to the recovery of by-products.

Possible Increase in the Sources of Production.

Calculations on this point are not easy, as the term casein is used to cover rennet casein as well as the products made with acid and the lactic quality. The conclusion to be drawn is that the possible sources are extremely extensive.

It is of intrest to know that even in the countries where the industry is in its infancy, new supplies of casein for the casein solids industry could be provided. Very often the manufacturing methods in vogue can easily be modified. In many countries, for long considered a negligible by-product, no special pains were taken to obtain casein. Today the situation is different.

The future of this very promising industry depends upon a steady and uniform supply of rennet casein and on the development of methods for the conversion of other types of casein into a raw material having the plastic properties required. Here is a splendid opportunity for the chemist.

(*This series of articles will be continued*)

Two New Uses for Pyroxylin

(*Continued from page 56*)

not as yet to have reached its limitations.

This comprises the use of a pyroxylin plastic, or other cellulose ester solution, which is applied as a sort of lacquer to a papier-mache article to allow of coating the same with metal by electroplating. The article is first given several coats of, say, "celluloid" solution, and is smoothed off and polished. After this, a suspension of bronze powder in a cellulose ester solvent, such as amyl acetate, chlorhydrin or the like, is sprayed on the object. This softens the cellulose ester coating enough to cause the bronze to adhere, but due to the fact that there is no actual cellulose compound in solution, the metal will retain its electrical conducting properties.

The article thus coated is then electroplated in the usual manner in an electroplating-bath.

(U. S. P. 1,599,608, Sep. 14, 1926; J. Brown and J. Mullinnix, assignors to Reliance Gauge Column Co., Cleveland, O.).

Aladdinite

The Brilliantly Colored Casein of Marvelous Beauty

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The Modern Aladdin

Has found perfection in Aladdinite, the first casein solid manufactured in the United States. The beautiful finished hues it may be obtained in; mottled or solid, buffalo horn or tortoise shell, all strong and durable; together with the fact that Aladdinite is **inexpensive, sanitary** and **non-inflammable,** makes it the ideal casein plastic. Insist on Aladdinite. Further information gladly furnished.

MADE FROM THE FINEST QUALITY IMPORTED CASEIN

Aladdinite Co., Inc.
ORANGE, N. J.

Production of Mottled Molded Objects

(Continued from page 64)

tablet 10 upon a smaller tablet 11 as in Fig. 7. In this instance, the larger tablet 10 being solid throughout and devoid of the central opening before mentioned, there would be no inward displacement of the material. However, the provision of the smaller tablet 11 affords an annular space 12 into which the material of both tablets is displaced. The material of the smaller tablet 11 being displaced laterally and that of the larger tablet 10 being displaced downwardly, causes the material to be intermixed, with more or less confusion about the periphery of the mold, thereby producing an irregular design, somewhat as illustrated in Fig. 2. To produce such striate design, whether of rayonnant or burled effect, the material is fused at a somewhat lower temperature than normal, that is, two hundred to two hundred and forty degrees, so that it flows slowly in a semi-fluid or plastic state, with the further provision of a recess into which the material is displaced while in such condition under pressure. This flow space can be variously provided, for instance, it is provided by the central orifices 4, and 7, of the annular tablet, or it may be provided by forming a marginal offset or rabbet as at 8, on the upper side of the charge, or as at 12 on the lower side of the charge. Each variation of the size, shape and position of such flow space, produces a variation of the resulant design. Moreoveer, with the flow space similarly positioned, the design may be varied by varying the initial fusing temperature, so that the material is flowed into such a space or recess, more or less quickly and in a more or less fluid condition. In lieu of providing the flow space in the charge itself, as heretofore described, the die, either male or

female may be provided with a recess 13, as shown in Fig. 8, into which the material will flow with somewhat the same effect when submitted to low fusing temperature. If such boss formed by the mold depression is not desired in the finished product, this boss may be removed subsequent to the removal of the product from the mold, leaving the surface ornamentation or design, produced by the movement of the material necessary to form such boss or process. In Figs. 9 to 14 there are shown suggestive forms or variations of the initial tablet or charge. These may be made with endless variety, and by differently positioning the charge tablet, centrally or off center or superposing tablets of different shapes one upon another, within the mold, an endless variety of designs may be produced.

Eighteen claims cover the process. The firm controlling the patent is well known among molders.

Non-Flammable Pyroxylin

Charles Horan, of New York, has patented a noninflammable pyroxylin composition (U. S. P. 1,594,201), which, he says, is suitable for electrical insulation, covering of wire, etc. The composition consists of 88 parts of collodion, 10 parts of ammonium phosphate and 2 parts of "gum camphor," with the further addition, which is optional, of 1% of alum.

It is stated that the composition, despite the fact that it is practically nothing more than ordinary pyroxylin, will not give off flame or smoke when heated. The claims cover a composition comprising from 85 to 89% of a collodion containing 5% of pyroxylin, from 8 to 15% ammonium phosphate and from 1 to 7% gum camphor. The essential feature appears to be the use of a larger quantity of the ammonium phosphate than of pyroxylin. Ammonium phosphate is well known in the art of fireproofing fabrics.

Bakelite Tariff New Hearing

According to the request of a group of New York importers, a new hearing in the proceedings involving alleged violation of certain patents held by the Bakelite Corporation has been set for early in February by the Tariff Commission.

Meyer Kraushaar, on behalf of the importers, protested against a ruling of the Treasury Department, denying multi-colored cigar and cigarette holders entry to the country, on the grounds that they were manufactured from synthetic phenolic resin, in violation of the patent rights of the complainant Company.

This was denied by the importers who offered to show proof before the Commission that the imported articles were manufactured in accordance with a European formula.

Albert M. Barnes, Jr., represented the complainants, who also argued that the importers had misrepresented articles in question as being manufactured from genuine Bakelite.

DuPont Buys Out Pacific Novelty Co.

LEOMINISTER, MASS., was recently invaded by an imposing array of auto trucks bringing the equipment of the Pacific Novelty Company from New York City. This Company was recently bought out by the Du Pont Viscoloid Company and was an important distributor of pyroxylin plastic articles. A new three-floor addition to the shipping building of the Viscoloid Company will house the Pacific Company and will make Leominister the sole shipping point for the former Company's products.

Carlstadt Concerns Merge.

THE sale was announced January 6 of the New York Eye Shield Company to the Columbia Protektosite Company, manufacturers of celluloid novelties. Both concerns are located in Carlstadt, N. J. The third unit of this rapidly expanding business was inaugurated last March at East Rutherford, N. J.

Synthetic Camphor Imports Increase.

ATTESTING the growing popularity of synthetic camphor as compared with the natural commodity, are the figures for the imports for November 1926, when 185,000 lbs. were imported, value $95,000, equal to the combined shipments of natural camphor, both crude and refined.

Col. H. C. DuPont Dies.

LONG regarded as the head of the famous Franco-American DuPont family, Col. Henry Algernon DuPont, former state Senator for Delaware, passed away at the great age of 88, Dec. 31, last, at his home near Wilmington, Delaware.

TECHNICAL ABSTRACTS

AND PATENT REVIEW

Resins from aliphatic aldehydes. W. O. Herrmann and H. Deutsch, assignors to Consortium fur Elektrochemische Industrie Ges. m. b. H., Germany. U. S. P. 1,600,113; Sep. 14, 1926. Application in Germany Oct. 20, 1921.

Aliphatic aldehydes, such as acetaldehyde, crotonic aldehyde, butyric aldehyde, etc. are polymerized or condensed into resins by heating with mineral acids. Example:

Example 1.

Add 800 parts of acetaldehyde to 400 parts of a 25 per cent sulphuric acid in a stirring vessel provided with a cooling jacket. The temperature is at first kept at above 40 centigrade degrees for several hours and then raised to 100 centigrade degrees. The reaction is stopped when a sample of the reacting mass gives a resinous product tough at ordinary temperature. This tough mass is washed and heated for a longer time at a temperature above 150 centigrade degrees. After cooling the product obtained is a hard resin. It may be cleaned by a washing process e. g. in a ball mill with water and after filtering off, remelted. By means of a rolling apparatus the molten resin can be brought into the form of shellac like sheets.

Imitation natural products made of pyroxylin plastics. John Henry Stevens and Wm. G. Lindsay, assignors to the Celluloid Co., Newark, N. J., U. S. P. 1,593,314; July 20, 1926.

Imitation horn and the like is made by taking thin sheets of pyroxylin plastic, such as are customarily shaved from blocks, printing upon them in colors the design which is to be imitated, re-forming the sheets into blocks and subsequently again shaving off sheets from such blocks.

Plastic resinous compositions containing liquid dicarboxylic aromatic acid esters as plasticizers. C. Conover, assignor to The Selden Co., Pittsburgh, Pa., U. S. P. 1,592,082; July 13, 1926.

Resinous compositions made from artificial resins capable of being hardened are rendered more pliable and less brittle by being mixed with liquid esters of the discarboxylic aromatic acids. The material is especially applicable to the glycerol phthalate resins. The plasticizer preferred is diethyl phthalate, but dimethyl phthalene, di-isopropyl phthalate and the like may be employed.

Glass substitute from cellulose acetate. J. and A. Colle, of Summit, N. J., assignors to Cello Products Co., U. S. P. 1,580,287, Apr. 13, 1926.

Wire netting, of the grade usually used for mosquito-netting, is coated with cellulose acetate so as to form a light, flexible and strong substitute for glass. Plasticizers such as triphenyl phosphate, ethyl-paratoluenesulfonamide, etc., are added to make the product less brittle. The addition of hexachloroethane will lower the inflammability still further.

For description of this see PLASTICS, 1926, Sept. p. 308.

Molded handle, etc. John B. Sanborn, Evanston, Ill. U. S. P. 1,599,924, Sep. 14, 1926.

Molded handles for percolators, etc., are so made that the metallic attaching members, by means of which the handle is fastened to the pot or other container, have a rounded end which is free to rotate within the hollow interior of the molded handle, so as to make attaching easy. Fusible metal is used to surround the insert. The heat hardens the molding composition and also melts out the fusible metal, thus leaving the metallic members free to rotate, yet held securely against withdrawal.

Plastic oxychloride cement composition. J. A. Ritchie, London, England, U. S. P. 1,602,212; Oct. 5, 1926.

Wood flour or other organic material used as a filler in oxychloride cement plastics is treated with just enough water that it will be moist, but still dry enough to run freely through the fingers. For example, 4 parts of damped wood flour is mixed with 11 or 12 parts of calcined magnesite, 4 parts of asbestos and 6 parts powdered quartz. Enough 21 to 23°BE magnesium chloride solution is added to make a mortar, which is poured into molds to set. Claims cover the dampening of the wood flour.

Phenol, Furfural, and Aldehyde Resin. Carleton Ellis, U. S. P. 1,592,773; July 13, 1926.

Phenol, paraldehyde and furfural are used in making a complex resin. Acetaldehyde and hexamethylenetetramine may also be used. One of the claims covers a "resinous material comprising the fusible resinous reaction products of a phenol with acetaldehyde and furfural, the material when freshly made being readily crushed between the fingers to a pulverulent non-tacky mass."

Cellulose Ether Solvent and Composition. L. Lilienfeld, U. S. P. 1,599,569; Sept. 14, 1926.

A viscous flowable film-forming composition, comprising an alkyl ether of cellulose dissolved in a compound solvent containing 60 to 20 parts by weight of nitro-methane 40 to 80 parts by weight of a lower monohydroxyl aliphatic alcohol.

Purification of Cellulose Ethers. J. Altwegg and C. A. Maillard, assignors to Societe Chimique des Usines du Rhone, Paris, France. U. S. P. 1,599,508; Sept. 14,1926.

The purification method, object of the present invention is based on the action of strong acids upon the crude ethers in solution, as revealed by the observation that a solution of crude ethers in a suitable solvent becomes gradually colourless after the addition of a certain quantity of strong acid. By precipitation, a white purified ether is obtained which, when redissolved, gives colourless solutions. As solvent liquid, acetic acid or any other suitable solvent, or mixtures of solvents, may be used. The strong acids which may be used for this purification are numerous. Foremost can be mentioned sulphuric and hydrochloric acids, then nitric and phosphoric and other acids.

Example I.— 15c. cms. of hydrochloric acid at 8 degrees Bé. are poured in a litre of acetic solution containing 100 grammes of crude ethyl-cellulose, obtained by the action of ethyl-chloride on sodium cellulose in a steel autoclave. After thoroughly mixing, the mixture is allowed to stand for 30 minutes at ordinary temperature. The ethyl-cellulose ether is obtained, by precipitation in a large quantity of water, under the form of a white mass which, washed and dried, constitutes a valuable raw material for the manufacture of varnishes, collodions, celluloids, films, threads, or fabrics.

Example II.—50 parts of crude ethyl cellulose containing about 40% of ethoxyl groups are dissolved in 500 parts of alcohol at 93 degrees, and 15 parts of sulphuric acid 35 degrees Bé. are added with stirring. After standing for one hour at a temperature of 20 to 25 degrees C. the mixture is poured in water and filtered, and the purified ether is washed and dried.

Phenol Furfural and Aldehyde Resin. Carleton Ellis, U. S. P. 1,592,296; July 13, 1926.

A detailed description of the difficulties encountered in making a nonsticking powder from phenol and furfural; together with processes for making resins from phenol, furfural and aldehydes. There are 18 claims.

Reducing Viscosity of Cellulose Nitrate. W. R. Webb, assignor to Eastman Kodak Co., U. S. P. 1,-598,949; Sept. 7, 1926.

Colloidized cellulose nitrate, such as film-scrap and other pyroxylin plastic waste, is treated with a bath containing 40% water, 50% ethyl alcohol and 10% of a strong mineral acid such as hydrochloric acid. Undissolved cellulose nitrate fibers may also be thus treated.

The alcohol makes the cellulose nitrate more permeable to the acid solution and thus hastens the operation. Other organic liquids may be used in place of the ethyl alcohol.

Motion-picture Film. H. E. Van Derhoef, assignor to Eastman Kodak Co., U. S. P. 1,602,599; Oct. 12, 1926.

Film of extra durability is produced by having a large number of minute projections, smaller in area than the perforations, at or near the edges of the film, which project only a few thousands of an inch but serve to prevent undue wear against the surface of the film.

Talking Motion-picture Film. Asa L. Curtis, U. S. P. 1,591,081; July 6, 1926.

In connection with the usual motion-picture film, the present invention comprises a film about twice as wide as usual, but with the picture space the same as in the regular films. There is a sound groove running the length of the film of, alternatively, a wire is imbedded in the film and the sound recorded magnetically thereon on the Pulson principle. A number of other grooves are also provided, perforated at suitable intervals. Metallic needles make contact through the perforations, or are kept out of contact, so as to throw certain loud-speakers in or out of the circuit. These loudspeakers are so arranged that the illusion of the sound coming from definite areas of the screen is more perfect.

Attaching Pyroxylin Mixtures to Dental Plates. D. Bumgardner, U. S. P. 1, 591,653; July 6, 1926.

A method of applying pyroxylin mixture to a dental plate which consists in first providing a space in the dental plate with a temporary removable filling to simulate the desired portion of the human gum, said dental plate having the artificial teeth already permanent secured to it, then investing the plate in a flask formed of separable parts, then removing the temporary filling and replacing it with the pyroxylin mixture previously softened by heat, then closing the flask and submitting it to a predetermined additional amount of heat to soften the pyroxylin mixture sufficiently without injuring it, and finally compressing the pyroxylin mixture while soft between the parts of the flask so that it fills the said space and adheres to the dental plate.

(*Continued on page 82*)

Technical Abstracts

(*Continued from page 81*)

The Stabilization of cellulose nitrate for pyroxylin plastic manufacture. G. Payras, Revue generale des matieres Plastiques, 1926, 2, 615,627.

A complete resume of this important problem, treated from the chemical and mathematic viewpoint; illustrated, with diagrams, tables and cuts. The complete article, of which this is the last installment, has 100 bibliographic references.

Cellulose nitrate collodions and pyroxylin plastic films. A Breguet, Revue generale des matieres plastiques, 1926, 2, 629,643.

The present installment of this article deals with the fractional precipitation of collodion and pyroxylin plastic solutions with various solvents; as precipitation of acetone solutions of pyroxylin plastics by benzene; solubility; influence of temperature; viscosity, etc.

Problems in the manufacture of pyroxylin plastics. Michel Reclus, Revue generale des matieres plastiques, 1926, 2, 645,655.

This, final, installment of a very interesting series of articles covering the chemical problems of "celluloid" manufacture, take up the properties of nitrates of non-cellulosic material contained in wood-cellulose; nitrolingnin; purification of wood-cellulose for pyroxylin manufacture; bleaching of cellulose nitrate; and the effects of stabilization. Numerous tables support the text.

ARTIFICIAL STONE. Otto Kell, Des Moines, Ia. U. S. Patent 1,590,-523, June 29, 1926.

Process of manufacturing artificial stone comprising mixing together Keen's cement and silica in dry form, adding thereto potassium chlorate dissolved in hot water and while the solution so formed is still hot until a paste like consistency is had, and pouring the mixture upon a highly-polished mold. The stone closely resembles marble.

DYEING CELLULOSE ESTERS AND ETHERS. W. Duisberg and Winfried Hentrick, Claus & Weinand assignors to Grasselli Dyestuff Corp. U. S. P. 1,587,708, June 8, 1926.

Ortho-aminoanthraquinone sulfonic acids, analagous to those disclosed in U. S. P. 1,587,669 (above), but with several other substituting groups are employed.

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Phenol Resins Formed in Situ

THE impregnation of electrical coils with hardenable phenolic resins has been quite a common thing, but certain difficulties have always been encountered. The chief trouble was to get a perfect impregnation without the use of solvents; and then to harden the resin completely, so that it would not soften if the coil got hot in use.

John J. Kessler, according to his recent U. S. P. 1,591,534, makes use of partially polymerized, fusible resins, and first distributes a suitable aldehyde through the coil, so that by subsequent heating, an infusible and insoluble resin will be formed right where it is needed most.

The process, according to some of the claims, is not limited merely to electrical apparatus, as the last claim (9) reads as follows:

"The process of indurating porous obects which comprises distributing an aldehyde throughout the object and then impregnating the object with an incompletely polymerized phenol aldehyde resin liquified by heating above the fusion point."

The inventor explains that tures containing the aldehyde group, such as formaldehyde, paraldehyde, hexamethylenetetramine, furfural etc."

A second patent specifically covering the indurating of porous objects was issued July 27, 1926, U. S. P. 1,593,579.

Leominster's Pyroxylin Industries

ACCORDING to an industrial survey instituted by the Department of Labor & Industries, pyroxylin plastic articles, value $6,743,783, accounted for slightly more than one-third (33.8%) of the total value of all goods manufactured in Leominister, Mass., in 1925.

Control of Hydraulic Presses

(*Continued from page 62*)

mechanism. Any one stage of the operating cycle may be altered in its sequence by adjusting the position of the proper cam, or it may be eliminated altogether for the time being.

The valve cams are of the plate type and very simple in construction. They are semicircular and slotted for ease in attaching to the sides of the cam plates. The latter are keyed to the cam shaft. When the die equipment is changed, the entire set of cams may be very readily changed also, if the new piece to be molded requires an altogether different timing. The necessary cams are so simple in construction that new sets can be very easily and cheaply made by the Maintenance Department of any molding plant.

The utility of this press is further widened due to the fact that it is equipped with mechanism for operating ejecting pins in both halves of the die. This is the first press of the moving head type where this has ever been accomplished.

When resetting the press for a new operation, or at any other time that it is desired to control any particular part or parts out of gear, the different units of the valve are controlled at will by hand levers. These levers are all located in a very convenient position at the front of the press.

The entire machine represents a very neat appearance. All mechanism is very compactly grouped and all piping is confined to the rear where it is out of the way, yet accessible. Special attention has been given to the elimination of leaky joints on both steam and water lines. Mechanically, the machine is very sturdy and rigid.

The major moving parts are guided through long babbitt filled bearings which slide on the polished strain rods.

This new machine has been inspected by prominent molding engineers from various parts of the country and is welcomed by them as being the greatest development in the way of machinery for the rapidly growing molding industry.

Demi-Amber Zyl Frames

(*Continued from page 62*)

method by which this is done.

Referring now particularly to the drawing, the numeral 10 designates a sheet of the raw material in that form in which it is most easily obtained. The sheet is substantially thin in cross section, being of a thickness such that it is possible to stamp from the same, demi-amber frames, and have the frames thus stamped approximately the ultimate thickness desired. This sheet is mottled in appearance, as clearly shown by the portion 11 in the drawing on page 62.

In the practical application of the process, a sheet of this material, by rolling or any suitable means is shaped into a split tube 12, such as shown in Figure 2 of the drawing.

Having obtained this tube 12, one proceeds to form the same into a group of semi-finished rims by subjecting the same, while rotated on a suitable lathe, to the cutting action of a gang cutter. This operation transversely grooves the tube 12, as at the points 13, to form a plurality of semi-finished rims 14, joined to each other by the very thin portions 15 of the tube 12, formed at the base of the grooves 13.

To finish these rims, they are individually severed from the tube 12, by cutting thru the wall of the reduced portions 15. The severed rims are then internally grooved to form an eyewire receiving groove 17, and then subsequently polished by any suitable means.

Gun Cotton and Metal Foil

(*Continued from page 60*)

fabrics. The order of material in the finished product, from the top down, is: metal, gelatin-glycerol-gum arabic layer, pyroxylin plastic layer containing camphor and other gums, and finally the rubber layer. The rubber is applied in solution in carbon tetrachloride. The process is covered by U. S. Patent 1,591,844, dated July 6, 1926.

This should provide, when lead is used, another good type of X-ray protector, or is a wrapper for photographic plate.

Durez

New Offices for General Plastics, Inc.

General Plastics, Inc., manufacturers of **Durez** molding compound, has opened offices both at New York and Chicago. The New York office, at 250 Park Ave., is in charge of Mr. Lowell P. Weicker.

The Chicago office, at 9 S. Clinton St., corner of Madison St. and across the street from the Northwestern Depot opened January 1, 1927. Mr. Thomas A. Ryan, formerly of the Northern Industrial Chemical Co., of Boston, is in charge. A warehouse has also been opened to supply the Chicago territory. Business thus far has been brisk and the outlook is very satisfactory.

Corn Sugar for Phenol Resins

THE phenol resin art is in a very active state, as is evidenced by the very large number of patents which are issuing in this field. The raw material useful for the production of molding compounds, is, apparently, inexhaustible.

Although it has been known for a long time that the aldehydes will combine with phenols to form resinous substances, and that the carbohydrates, such as sugars, starches and various forms of cellulose were, theoretically at least, capable of yielding substances giving an aldehyde reaction, the condensation of such carbohydrates was not, until very recently, successfully carried out.

Other carbohydrates, as the pentoses, are also suitable. The most recent addition to this type of moldable resin is described in minute detail in the U. S. Patent 1,593,342 of Joseph V. Meigs, of Jersey City, N. J. The resins produced are dark in color, and of the slowly-hardening type.

Dextrose Used

The interesting feature of the invention is the use of dextrose or corn sugar (Argo corn sugar containing 84.1% of dextrose was used). Among the many examples given, but one will be reproduced, as the underlying principle is practically the same.

600 grams of phenol were melted and placed in a glass distilling flask. Five grams of concentrated sulfuric acid were added and the whole mixture heated to 130°C. Then 500 grams of the Argo corn sugar were gradually added and dissolved by heating, which was continued until at 126°C ebullition took place. Water and phenol boiled off. By suitable condensers the water was allowed to distill over while most of the phenol was refluxed back into the flask. Boiling was con-

tinued for several hours, the highest temperature being 180°C. The excess phenol was finally removed by vacuum distillation. The residue in the flask consisted on cooling, of a black, fusible, soluble and easily powdered resin.

The hardening of this resin is accomplished by the use of hexamethylenetetramine. To make a typical molding compound, the inventor proceeds as follows:

Molding Powder

500 grams of the resin was ground in a ball mill with 4% (20 grams), of hexamethylenetetramine and 610 grams of dried ground wood-fiber. The resulting composite powder was then further treated by thorough working on differential rolls heated to about 80°C whereby the wood-fiber became impregnated with the fusible resin and hardening agent. The resulting composite material was then ground to a coarse powder. Portions of the latter were placed in a steel mold and compressed at a temperature of 170°C for five minutes, resulting in the production of a black, hard, inert, infusible, shaped mass which had a transverse breaking strength of 6440 lbs. per square inch.

Catalysts Used

Catalysts other than the sulfuric acid can be used; such as bases as aniline, naphthylamines, phenylene diamines, etc. Other catalysts mentioned are thiocarbanilide, ammonium chloride, hexamethylenetetramine, sodium or potassium hydroxide, sodium alcoholate, anydroformaldehydeaniline, furfural, and ammonia. Aniline may partially replace the phenol in the resin, and stearic acid may be worked directly into the resin during its formation to act as a mold-lubricant.

Twenty-one claims define the invention, these being directed primarily to a "substantially anhydrous resinous reaction product of a dehydrated hexose or hexose-yielding carbohydrate, from which water has

Accessories
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been split off, a phenol, sulfuric acid in amount between 0.8% and 3% of the total weight of the phenol used, and a hardening agent."

It is evident from what has gone before, that despite previous practice resins can be made without the use of formaldehyde. The developers of the new product are still at work on further investigations and it is likely that this material will find quite unexpected applications. At present the full extent of use of the new product is not divulged.

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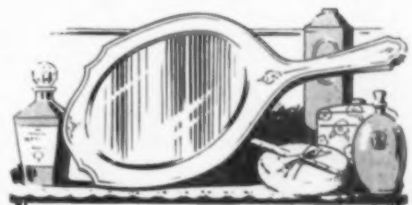

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Terkelsen Machine Co.
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Chas. F. Elmes Engineering Works
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Metalwood Mfg. Co.
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R. D. Wood Corp.
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PHENOL RESIN
Bakelite Corporation
General Plastics Inc.
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Hydraulic Press Mfg. Co.
Burroughs Co., The.
Chas. F. Elmes Engineering Works
Dunning & Boschert Press Co.
French Oil Mill Machinery Co.
Metalwood Mfg. Co.
R. D. Wood Corp.
A. B. Farquar
Terkelsen Machine Co.
PRESSES—HYDRAULIC
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Evarts G. Loomis Co.
Hydraulic Press Mfg. Co.
Terkelsen Machine Co.
Watson-Stillman Co.
Chas. F. Elmes Engineering Works
Dunning & Boschert Press Co.
French Oil Mill Machinery Co.
Metalwood Mfg. Co.
R. D. Wood Corp.
A. B. Farquar
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Chas. F. Elmes Engineering Works
French Oil Mch. Co.
R. D. Wood Corp.
Metalwood Mfg. Co.
A. B. Farquar
Terkelsen Machine Co.
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Fiberloid Corp.
Nixon Nitration Works
Celluloid Co.
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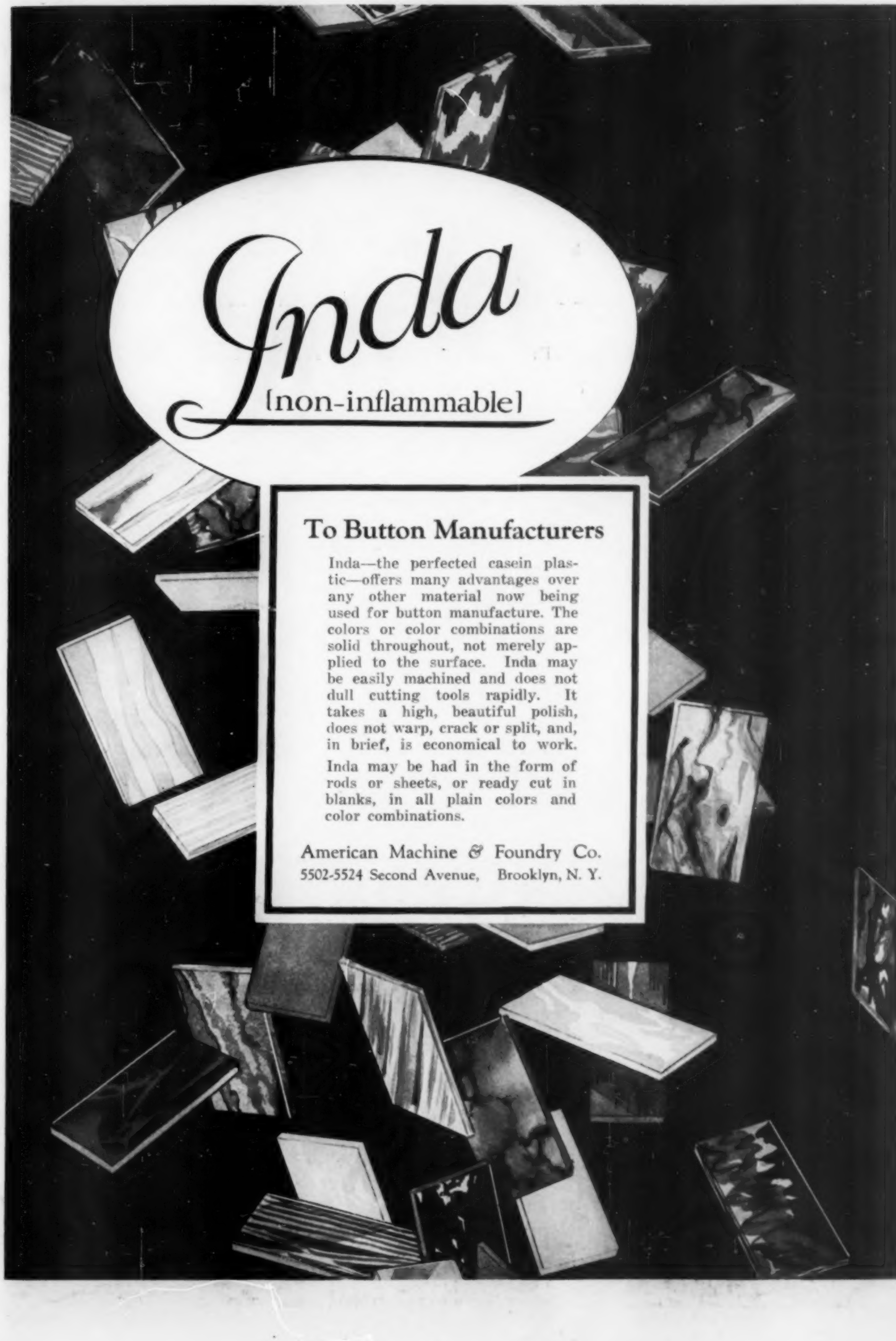
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